State of Illinois
Department of Registration and Education
STATE GEOLOGICAL SURVEY DIVISION
John C. Frye, Chief

# GUIDE LEAFLET

## GEOLOGICAL SCIENCE FIELD TRIP

Sponsored by
ILLINOIS STATE GEOLOGICAL SURVEY

## LENA AREA

Stephenson and Jo Daviess Counties

Lena, Elizabeth and Galena Quadrangles

Leaders
Edgar Odom, George M. Wilson, Guy Dow

Urbana, Illinois
September 9, 1961

GUIDE LEAFLET 1961D

HOST: Lena-Winslow High School

# THE LENA GEOLOGICAL SCIENCE FIELD TRIP

## ITINERARY

Suggestion: Have someone read the guide as we travel through the countryside so that the driver will be able to learn the geology of the area, also.


### Abstract

Lena is situated on the glaciated plain adjacent to the non-glaciated area of northwestern Illinois. The glacial sequence includes Winnebago Drift, lake silts and sands of Altonian Age, and loess of Woodfordian Age.

The Galena Dolomite, Maquoketa Shale (Ordovician) and the Niagaran Dolomite (Silurian) compose the bedrock formations. In the non-glaciated area difference of these formations in resistance to weathering accounts for a marked bedrock control of the topography, characterized by mounds, narrow ridges, and sweeping slopes. The mounds are capped by Silurian dolomite. Slopes are underlain by weak Maquoketa shale. The mounds and ridges rise to approximately the same elevation. These summits form a surface correlated with the Dodgeville Peneplain of Tertiary Age.

The trip includes a visit to the zinc and lead district centered around Galena, Jo Daviess County, where specimens of galena, sphalerite, pyrite, calcite, limonite and other less abundant lead-carbonate minerals may be found.

Drainage derangement caused by glacial action is superbly illustrated by Apple River. During pre-Altonian time, Apple River flowed to the southeast. It now flows southwest through a deep gorge eroded when the Altonian Glacier blocked the southeast course.


0.0 0.0 Assemble at front of Lena-Winslow High School, heading west on Freemont Street.

0.1 0.1 STOP. Turn right on Lena Street.

0.4 0.5 STOP. North Schyler Street. Continue straight ahead.

0.4 0.9 SLOW. Turn right on Lake Le-aqua-na Road.

1.1 2.0 Galena Dolomite outcropping in road cut on right and left.

0.7 2.7 Galena Dolomite on right and left. The dolomite is capped by a thin cover of glacial till and loess.

## Summary of The Pleistocene History of Illinois

Tens and hundreds of thousands of years ago most of Illinois, together with most of northern North America, was covered by huge glaciers. These glaciers expanded from centers in central and eastern Canada. They developed when the mean annual temperatures were somewhat lower than now, so that not all of the snow that fell during the winters melted during the summers. The snow residues accumulated year after year until a sheet of ice was formed so thick that as a result of its weight, it began to flow outward, carrying with it the soil and rocks on which it rested and over which it moved. The process continued until the glacier extended into our country as far south as Missouri and Ohio Rivers.

Moderation of temperatures halted the glacier. For a while the melting of the ice balanced its accumulation and expansion, so that its margin remained stationary. Later the melting exceeded the accumulation and expansion, and the ice-front gradually melted back until the glacier disappeared entirely.

It is now commonly known that there were four major periods of glaciation during the Pleistocene or Great Ice Age (see accompanying illustration), and that between each there was a long interglacial period in which conditions were much as they are today. It is also commonly known that during each major glaciation there were a number of retreats and readvances. This was particularly true during the last or Wisconsinan glacial stage.

A complete discussion of Pleistocene (Ice Age) history would require a sizable volume, in fact, the story is still not fully known. Present facts indicate that this era of geologic history began about one million years ago when the Nebraskan glacier advanced over the area. This oldest glacier is named Nebraskan because the typical Nebraskan glacial deposits are best developed in the state of Nebraska. Nebraskan deposits are not abundant in Illinois probably because weathering during the Aftonian interglacial stage after the retreat of the Nebraskan glacier destroyed them.

The next glacial episode produced the Kansan glacier which again advanced from the west. Thick deposits of till and outwash sand and gravel were deposited in Illinois when the Kansan glacier withered away.

The Kansan stage was followed by the Yarmouthian interglacial stage during which erosion carved valleys and hills in the Kansan deposits.

The third glacial stage, the Illinoian, is important to the residents of Illinois. It covered 80 percent of Illinois, reaching southward to Carbondale and Harrisburg. In contrast to the preceding glacial advances, the Illinoian came from the east rather than the west.

After several thousands of years, climatic conditions caused the melting away of the Illinoian ice sheet. During this warm stage, the upper part of the Illinoian till was weathered and soil developed, just as in the case of the preceding Yarmouthian interval. However, this action did not take place to the degree it did during the Yarmouthian, so that the post-

Illinoian (Sangamonian) interval is estimated to have lasted only about 150,000 years. The Sangamon soil resembles present day soils in color, texture, and depth of development. This fact lends support to theory that the climate existing during interglacial times was similar to the present climate. The theory that we are living in an interglacial interval has been advocated by numerous glacial geologists. We should not brush this thought aside for it is estimated that a drop of only five degrees in the average annual temperature would bring another glacier down upon us.

The last and most recent glacial stage was the Wisconsinan. This glacier advanced southward from the Lake Michigan Basin to the present sites of Shelbyville, Charleston, and Peoria where it formed a terminal moraine that geologists call the Shelbyville Moraine. The Shelbyville Moraine was built by the Wisconsinan glacier approximately 20,000 years ago.

As the Wisconsinan Glacier retreated, withdrawals and readvances created a complex sequence of deposits in northeastern Illinois, the most outstanding of which are the moraines. More than fifty separate moraines were formed by this glacier in Illinois alone. The major ones are shown on the accompanying glacial map of northeastern Illinois.

To appreciate the significance of the Pleistocene history and its effects on the inhabitants of Illinois, we need to consider only the rich soils formed from the glacial deposits, and the abundant deposits of sand and gravel of glacial origin in our state. We definitely would not have these treasures had the glaciers missed Illinois.

In this discussion are a number of terms that are unfamiliar to many persons. The following discussion will clarify many of these terms as well as explain some of the various types of glacial deposits found in Illinois.

As the glacier melted, all of the soil and rocks which it had picked up as it advanced were released. Some of this material or drift was deposited in place as the ice melted. Such material consists of a thorough mixture of all kinds and sizes of rocks and is known as <u>till</u>. Some of the glacial drift was washed out with the melt-waters. The coarsest <u>outwash</u> material was deposited nearest the ice-front and gradually finer material farther away. The finest clay may have been carried all the way to the ocean. Where the outwash material was spread widely in front of the glacier it forms an <u>outwash-plain</u>; where it was restricted to the river valleys it forms <u>valley-trains</u>.

As shown on the accompanying map, there are many moraines in Illinois. The moraine represents the accumulation of drift at the ice-margin while the advance and melting were essentially in balance, when more and more material was being brought to the edge of the advancing ice.

With the exception of the Shelbyville moraine, which marks the maximum advance of the Wisconsinan glacier, each marks the position to which the ice-front readvanced after a recession of unknown distance from the position it had previously attained.

The surface relief of moraines is generally greater than that of the drift-plains. It is generally referred to as swell-and-swale, but on some moraines it is termed knob-and-kettle topography. Generally, the outer slope and edge of the moraines is interrupted by valleys and re-entrant angles marking the courses of glacial rivers. At some places, there are gaps in the moraines where subglacial streams presumably carried away most of the drift. Subglacial valleys may be distinguished from valleys developed by erosion in postglacial time by the fact that morainic topography occurs all the way down the valley slopes.

As a glacier began to recede, melt-water gradually accumulated in local ponds or lakelets between the ice-front and the moraine last formed, except where there were channels through the moraine through which it could drain. Where such drainage channels are absent, it may be presumed that as the ice-front continued to recede, the local ponds and lakelets gradually merged into one large lake which persisted until the glacier uncovered some passage or until some river eroded a channel through which the lake could be drained.

At times, especailly in the winters, the outwash-plains and valley-trains were exposed as the melt-waters subsided, the wind picked up silt and fine sand from their surfaces, blew it across the country, and dropped it to form deposits of what is known as loess. Glacial loess mantles most of Illinois. Near the large river valleys it may be as much as 60 to 80 feet thick. Far from the valleys it may be measured only in inches, if it can be identified at all.

0.5 3.2 STOP 1. Quarry in Galena Dolomite.

The Galena Formation of Middle Ordovician Age is exposed extensively in northwestern Illinois. Over most of the area it is a dolomite, that is, it consists of calcium magnesium carbonate ($CaMg CO_3$) in contrast to limestone which is mostly calcium carbonate ($CaCO_3$). In some places through northwestern Illinois the formation is as much as 225 feet thick.

The Galena is divided into three members. The lower Prosser Member is 150 feet thick and consists of a lower cherty portion 105 feet thick and an upper non-cherty portion 45 feet thick. Overlying the Prosser is the Stewartville Member, a thick-bedded dolomite except in the upper 10 feet where it becomes thinner-bedded. The Dubuque Member, the upper 45 feet of the Galena Dolomite, is in general thin-bedded, argillaceous, and has many shale partings.

Within the Galena Formation are two zones of *Receptaculites oweni*, a fossil believed to be a type of sponge. This fossil is found only in the Galena Formation and serves to differentiate the Galena Formation from those above and below. Prominent *Receptaculites* zones occur in the Prosser Member and in the Stewartville Member.

Near the top of this quarry is a zone of *Receptaculites*. It is believed to be the upper zone that occurs near the base of the Stewartville Member.

0.4 3.6 Lake Le-aqua-na State Park on left.

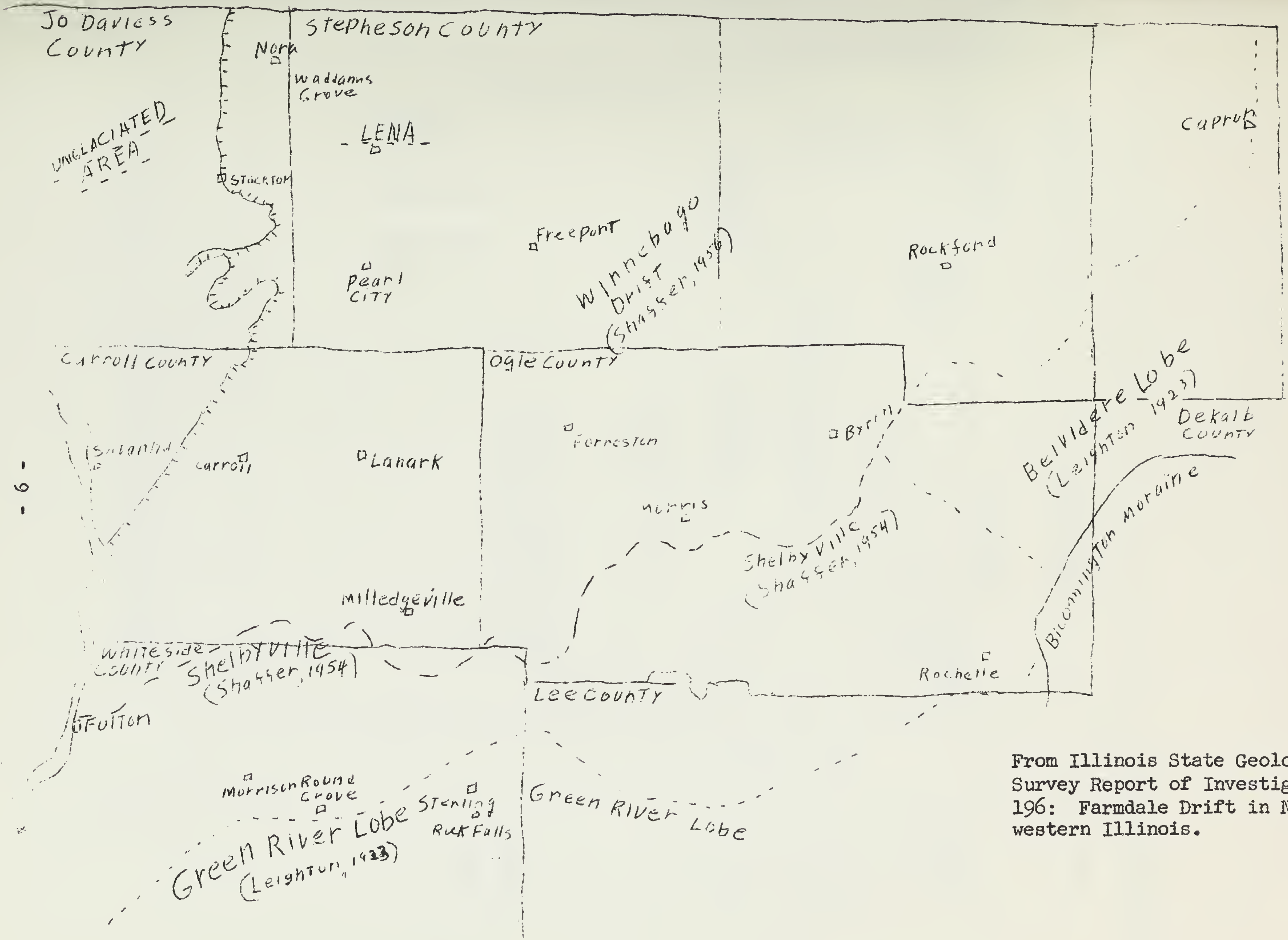
0.9 4.6 Glacial till of Altonian age exposed in road cut on right and left.

The glacial geology of northwestern Illinois has engaged the attention of geologists for more than a century. The first extensive study of these deposits was by Leverett (1899). He states, "In the portion of Illinois north from the latitude of Rock Island, the Iowan drift occupies a large part of the interval between the glacial boundary and the outer moraine of the Wisconsin series. A drift, tentatively referred to the Illinoian, forms the surface sheet in the region in Stephenson County and part of Winnebago, Ogle, Whiteside, Carroll, and Jo Daviess Counties." Leverett used the term "Iowan" to denote a separate glacial stage occurring between the Wisconsinan and the Illinoian.

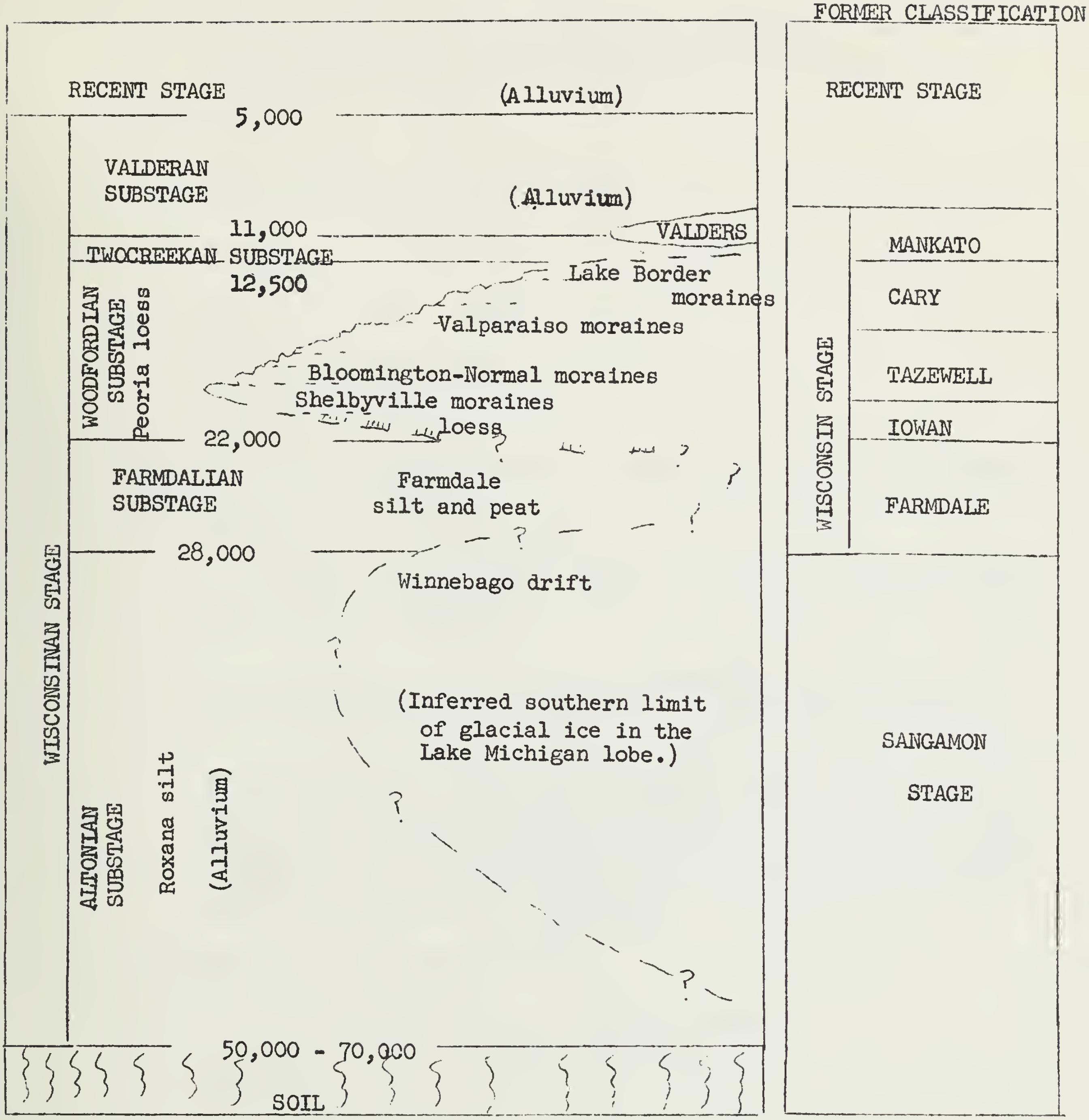
In 1923, Dr. Morris M. Leighton in his studies of the glacial deposits of northwestern Illinois defined the Belvidere and the Green River Lobes (see fig.). He thought the Belvidere lobe was early Tazewell (Shelbyville) and the Green River lobe Iowan, a substage of the Wisconsinan and older than the Tazewell. All the till deposits north and northwest of the Belvidere and Green River lobes were regarded by Leighton as Illinoian in age, although he recognized that they were younger than the Illinoian in southern Illinois.

In 1954, Dr. Paul Shaffer extended Leighton's Belvidere lobe into eastern Iowa and defined it as the Shelbyville of early Tazewell age. Again, the drift north of the Shelbyville boundary was regarded as Illinoian in age. In 1956, Shaffer continued studies of the glacial deposits of northwestern Illinois. His proposal that the drift long considered Illinoian was deposited during the Farmdale Substage of the Wisconsinan was published in Illinois State Geological Survey Report of Investigation 198, "Farmdale Drift in Northwestern Illinois." The Farmdale was considered to be the first substage of the Wisconsinan Stage. This discovery correlated well with loess deposits recognized by Leighton and others along the Illinois and Ohio Valleys. Thus, the till deposits of northwestern Illinois long considered Illinoian were proven to be Wisconsinan. Now it is assumed there are few Illinoian glacial deposits in extreme northwestern Illinois.

In most geologic problems new evidence often changes old ideas and concepts. In 1960, Drs. Frye and Willman revised the classification of the Wisconsinan in the Lake Michigan lobe. This reclassification compared with the old is presented in the following illustration from Illinois State Geological Survey Circular 285, "Classification of the Wisconsinan stage in the Lake Michigan Glacial Lobe."




From Illinois State Geological Survey Report of Investigation 196: Farmdale Drift in Northwestern Illinois.




From Illinois State Geological Survey Circular 285, "Classification of the Wisconsinan Stage in the Lake Michigan Glacial Lobe."

The most important point in this reclassification in relationship to the glacial deposits of the Lena area, is that they are now considered even older than the Farmdale of Shaffer's and belong to a separate glacial advance. Also, the length of the Wisconsinan Stage has been extended some 20,000 years.

0.1 4.6 SLOW. Turn left, west.

0.2 4.8 Note the gently rolling nature of the topography. As we proceed westward toward the nonglaciated area, the topography becomes considerably sharper and more dissected.

0.3 5.1 T road north, continue ahead.

0.4 5.5 Note prominent mound ahead (west). This is a bedrock high, one of many in this region.

0.6 6.1 Drainage is to the southeast toward the Pecatonica River.

0.1 6.2 SLOW. Crossroad. Continue ahead.

0.5 6.7 Outcrop of Galena Dolomite on left.

0.7 7.4 SLOW. Turn left (southwest).

0.5 7.9 STOP. Turn right (northwest). Note excellent view toward the west.

0.6 8.5 STOP 2. (Top of Waddams Hill)

Waddams Hill is one of a host of mounds in the field trip area. On a clear day, a remarkable view of the surrounding flat glaciated plain can be enjoyed.

Presumably, this hill was overridden by the Altonian glacier which deposited the Winnebago Drift in northwestern Illinois.

This mound is held above the surrounding plain by resistant Silurian dolomite. During the course of today's trip we will see how the bedrock controls the topography of the region. In this area the Galena and Silurian Dolomites form steep cliffs and the softer, shaly Maquoketa Formation, forms gentle slopes and broad terraces. In the area of Waddams Hill the topography has been modified considerably by glaciation.

0.3 8.8 SLOW. Entering Waddams Grove.

0.8 9.6 SLOW. Railroad crossing. Extremely dangerous.

2.2 11.8 Note that the non-glaciated area is conspicuous on the western horizon.

0.5 12.3 SLOW. Turn left on Apple River Canyon State Park Road.

0.3 12.6 Village of Nora ½ mile to north.

0.3 12.9 STOP. Continue ahead.

0.6 14.0 Note severe erosion in gully on right.

0.5 14.0 STOP. Highway 78. Continue ahead on Apple River Canyon road.

1.1 15.1 Approximate boundary between glaciated and non-glaciated area.

0.3 15.4 SLOW. Narrow bridge.

0.7 16.1 Crossroad.

0.3 16.4 SLOW. Begin descent into Apple River Canyon.

0.1 16.5 Note outcrop of Galena Dolomite on the left.

0.8 17.3 SLOW. Sharp turn.

0.1 17.4 Entering Apple River Canyon State Park.

0.3 17.7 Turn right (north).

0.0 17.7 STOP 3. Apple River Canyon.

Apple River is an excellent example of the effects of glaciation upon drainage. Before the Wisconsinan Glacial stage Apple River drained south along the valley of the South Fork of Apple River past Stockton and along the Silurian Escarpment to the valley of Yellow Creek, thence into the Pecatonica River south of Freeport.

When the Wisconsinan ice invaded the area during the Altonian Substage, South Fork was dammed near Stockton. The waters of Apple River spilled over the low divide southwest of the park and carved out the deep Apple River Canyon. The canyon is nearly 200 feet deep, trends in a nearly straight NE-SW direction, and is over 4 miles long. The canyon is eroded in the Galena Dolomite.

The pre-Altonian drainage can be interpreted as follows: Before the advance of the glacier there were two drainage systems: Apple River including Mill Creek, Holts Branch, Coon Creek; and the present Apple River as far northeast as the mouth of Apple River Canyon constituted one drainage system. The valleys now occupied by West Fork and South Fork with several small tributaries constituted another drainage system. Between the two systems was a divide where the main canyon is now located.

Note that South Fork now drains to the north, a reversal of its former course.

A more detailed summary of the history of Apple River Canyon is contained in Illinois Geology Survey Bulletin No. 26, "Geology of the Galena and Elizabeth Quadrangles."

| | | |
|---|---|---|
| 0.0 | 17.7 | <u>STOP 4</u>. LUNCH. Apple River Canyon Picnic Area. |
| 0.7 | 18.4 | Turn left. |
| 0.2 | 18.6 | Turn right. |
| 0.1 | 18.7 | End of blacktop road. |
| 0.5 | 19.2 | SLOW. Turn sharp left (west). |
| 0.2 | 19.4 | Turn sharp right (north). |
| 1.1 | 20.5 | Crossroad. Continue ahead. |
| 0.2 | 20.7 | Note high hill on left. |
| 0.2 | 20.9 | Galena Dolomite exposed in ditch on right and left. |
| 0.6 | 21.5 | STOP. Turn left on blacktop road to Apple River. |
| 1.1 | 22.6 | <u>STOP 5</u>. Outcrop of Maquoketa Shale. |

The Maquoketa Formation in the non-glaciated area is approximately 200 feet thick. Maquoketa consists of shale and interbedded dolomites. This is one of the best outcrops of Maquoketa Formation in the Apple River area, but even here it is poorly exposed. The shales of the Maquoketa weather very rapidly to broad slopes, while the dolomites of the Galena Formation and the Niagaran Series are resistant and form steep cliffs or flat terraces.

Extensive flat areas and long sweeping slopes are characteristic features of the topography of the non-glaciated area. These reflect the bedrock control of the topography, directly traceable to the underlying rock strata.

The most conspicuous flat is the top of the mounds and sharp ridges in the area. This flat is formed on the Silurian dolomites of the Niagaran Series. The second flat is lower than the Niagaran Dolomite and is situated at the top of the Galena Dolomite at approximately 150 feet below the Niagaran flat. The present streams are now entrenched 20 or 30 feet below the Galena flat.

In a few spots, terraces are present that correlate with resistant dolomite beds in the Maquoketa Formation. Throughout the region, however, the highest hills, regardless of the rock composing them, all rise from 1,100 to 1,200 feet high. These crests are believed to be remnants of what was once a continuous plain (peneplain) formed when the region lay lower than it does today. At a past time, long-acting erosion cut away still higher hills and reduced the region to this plain surface. Later the region was again uplifted, and erosion is actively cutting it down and dissecting it into a maze of narrow ridges and deep valleys. If nothing intervenes, a new peneplain will be formed slightly above the level of the Mississippi River.

The region preserves this long erosional history because it was never covered by glacial ice. This non-glaciated region, entirely surrounded by glaciated country, is world-famous as "The Driftless Area." This is actually an incorrect name for the area is not driftless, but non-glaciated. Drift is the term used by geologists to designate all types of glacial deposits such as till, loess, outwash sand and gracel, etc. It is thought that this region was never glaciated, but it certainly isn't driftless. There are thick deposits of loess, a wind-blown silt of glacial origin, throughout the region.

0.3 22.9 SLOW. Entering Apple River

0.8 23.7 Galena Dolomite outcrop on left.

0.2 23.9 SLOW. Turn left on Woodbine Road.

1.6 25.5 Bridge crossing Apple River.

1.7 27.2 Woodbine Road turns left. Continue straight ahead on road to Summit of Sumner Hill.

0.3 27.5 Ascending Sumner Hill.

0.3 27.8 Note rubble of Silurian dolomite in roadcut on right.

0.1 27.9 STOP 6. Crest of Sumner Hill

From this vantage point one can enjoy an excellent view of the non-glaciated area. Like the other mounds in the area Sumner Hill is capped by Niagaran dolomite. This dolomite contains white chert which is left behind as a residue as weathering decomposes the dolomite. Residual chert can be seen in the road cuts near the top of the hill. The hill also is capped by a mantle of loess. In most instances, loess is the parent material of the fertile soils of the area. We will examine a soil profile developed in loess at the next stop.

0.2 28.1 Maquoketa Formation outcrops in ditch on right along slope of Sumner Hill.

0.8 28.9 Galena Dolomite outcropping on right.

0.1 29.0 STOP 7. Soil Profile Developed in Loess.

The soil profile is approximately as follows: A zone, dark colored, rich in organic matter 6-8 inches; B zone, chocolate brown, oxidized 4-5 feet; Galena Dolomite 4-5 feet.

The soils of Jo Daviess County are very fertile. The parent material of these soils is not the underlying bedrock formation, but loess that was deposited over the countryside by wind during the Pleistocene, mainly during the last stage of Glaciation. Loess is nothing more than fine rock flour of silt size. It is rich in variety of minerals which upon weathering, yield nutrients essential for plant growth. Most of the soils of Illinois are developed in loess.

We can never overemphasize the importance of the rich soils in the United States, particularly in the Midwest. Soils vary greatly in richness and character from place to place. Yet, in mature soils we can recognize zones that are common to all. The zonal effect comes about because the four major weathering processes progress at different rates, although all of them depend on the downward movement of groundwater. The processes, listed according to their rate of progress and beginning with the most rapid, are (1) oxidation; (2) leaching of carbonates; (3) decomposition of more resistant minerals; and (4) accumulation of humus.

In the A zone, in which humus material from decaying plants has accumulated, we find the rock minerals oxidized, leached, and decomposed. In the upper part of the B zone the rock minerals are only oxidized (shown by reddish or yellowish color caused by oxidation of iron minerals). The leached zone is determined by absence of carbonate rocks, such as limestone, and is revealed by tests with a solution of hydrochloric acid.

0.3 29.3 SLOW. Turn right (north)

0.5 29.8 STOP. Turn left on blacktop road (west). For the next 15 miles we will be treated to some of the finest scenery in Illinois.

1.6 31.4 Note the fascinating gentleness of the topography---interesting and beautiful.

0.3 31.7 Galena Dolomite outcropping in roadcut on right.

0.6 32.3 Outcrop of Maquoketa formation on left.

0.4 32.7 Note the conspicuous development of the Galena Terrace about 20 to 30 feet above the present streams, and that the Galena Dolomite outcrops repeatedly in roadcuts through this terrace.

0.6 33.3 SLOW. Crossroad. Village of Scales Mound 1 mile to north.

0.9 34.2 Scales Mound. Elevation -- 1104 feet.

Highest rock on mound is cherty Silurian Dolomite of Kankakee Formation. Numerous small marine fossils and the honeycomb coral Favosites occur in this rock.

Note how huge blocks of the dolomite have slumped down the sides of the slope due to the weathering away of the soft Maquoketa Shale which underlies the dolomite. Maquoketa outcrops occur in the road cut.

| | | |
|---|---|---|
| 0.3 | 34.5 | Note excellent view to west. In the far distance is the tailings pile of the Vinegar Hill sphalerite mine. Continue ahead on blacktop road. |
| 0.5 | 35.0 | Silurian Dolomite outcropping on right. Note that there is considerable chert in the Silurian. |
| 0.5 | 35.5 | STOP 8. Scenic View. |
| 0.5 | 36.0 | From this point to Galena the road follows a northeast - southwest trending ridge. The rocks exposed along the crest are Silurian in age. |
| 0.8 | 36.8 | Note the contour farming that is practiced in the region. |
| 1.0 | 37.8 | Exposure of Silurian Dolomite on right. |
| 1.5 | 39.3 | Note slumping of loess on left. |
| 0.5 | 39.8 | Note tailings pile of Vinegar Hill Mine on far right. |
| 1.9 | 41.7 | SLOW. Steep Hill. |
| 0.1 | 41.8 | Quarry in Galena Dolomite on right. |
| 0.6 | 42.4 | Note conspicuous terrace on right. This is a depositional terrace called the Mississippi Terrace formed when the valley of the Galena River was filled during the Ice Age. This is a lake deposit. |
| 0.3 | 42.7 | Crossing Galena River. |
| 0.6 | 43.3 | Entering city of Galena |
| 0.3 | 43.6 | Note outcrop of Galena Dolomite on right and cave near top of outcrop. |
| 0.2 | 43.8 | Turn right on Meker Street. |
| 0.1 | 43.9 | Cross Broadway, turn left on Bench Street. |
| 0.1 | 44.0 | Continue ahead on Bench Street. |
| 0.1 | 44.1 | STOP. Continue ahead on Bench Street. |

0.1 44.2 Note large buildings built of native stone, the Galena Dolomite.

0.2 44.4 Continue ahead on Bench Street.

0.2 44.6 STOP. Junction Highway 20. Turn left on U. S. Highway 20.

0.1 44.7 Bridge over railroad and Galena River.

0.2 44.9 SLOW. Turn right on Fourth Street. Continue ahead on blacktop road.

0.3 45.2 Blacktop road ends. Continue ahead on gravel road.

0.7 45.9 Note outcrops of Galena Dolomite on right and left.

0.7 46.6 T-road South. Continue ahead.

2.6 49.2 STOP 9. Tri-State Zinc Mining Company.

The Galena region is one of the oldest lead and zinc mining regions in the United States. The following historical summary is from Ill. State Geol. Survey Report of Investigations 210, "Crevice Lead-Zinc Deposits of Northwestern Illinois, 1959." The shallow lead-zinc deposits of the Upper Mississippi Valley mining region, of which those in northwestern Illinois are a part, were the nation's principal source of the lead ore between 1820 and 1865. Peak production was reached in the years 1845 to 1847 when the annual output was 27,000 tons of lead metal. As the known richer and shallower deposits were depleted, as market conditions changed, and as various factors adversely affected the supply of miners, lead mining declined to a fraction of its former importance. At present only a few hundred tons of ore are taken from the shallow deposits each year. Zinc, gained almost exclusively from the larger deeper flat and pitch deposits, is now the chief product of the district.

Galena and sphalerite ores occur in the region in two geological settings, crevice fillings and flat and pitch deposits. The crevice deposits are in a general way vertical joint-like fissures. These ores are believed to have been deposited along solution cavities in the Galena Dolomite. Thus far, crevice deposits have been found only in the Galena Dolomite.

Flats are horizontal veins along bedding planes of the host rock and pitches are veins along inclined fractures. The lead and zinc deposits of northwestern Illinois are thoroughly covered in Report of Investigations 210 which can be ordered from the Survey for 25 cents.

You may find the following suite of minerals in the spoil piles: Galena, Sphalerite, Pyrite, Marcasite, Calcite, Cerussite, Anglestie, Smithsonite, and Limonite.

The large tailings piles south of the Tri-State Zinc mill are baren of ore minerals. This is host rock from which the mineral has been separated.

End of trip. Thanks for coming. Next trip Georgetown, September 23.

GENERALIZED GEOLOGIC COLUMN FOR JO DAVIESS AND STEPHENSON COUNTY

| ERAS | | PERIODS | EPOCHS | REMARKS |
|---|---|---|---|---|
| Cenozoic "Recent Life" | Age of Mammals | Quaternary | Pleistocene | Wisconsinan glacial till along east edge of area. Loess deposits on upland & alluvium in river valleys. |
| | | Tertiary | Pliocene<br>Miocene<br>Oligocene<br>Eocene<br>Paleocene | Present in southern Illinois |
| Mesozoic "Middle Life" | Age of Reptiles | Cretaceous | | Present only in extreme southern Illinois. |
| | | Jurassic | | Not present in Illinois. |
| | | Triassic | | Not present in Illinois. |
| Paleozoic "Ancient Life" | Amphibians Early Plants | Permian | | Not present in area |
| | | Pennsylvanian | | Not present in area |
| | | Mississippian | | Not present in area |
| | Age of Fishes | Devonian | | Not present in area |
| | Age of Invertebrates | Silurian | Cayugan | Not present in this area |
| | | | Niagaran | Present only on highest mounds south and west of trip area. |
| | | | Alexandrian | Kankakee cherty dolomite Edgewood thin-bedded earthy dolomite in outcrop. |
| | | Ordovician | Cincinnatian | Maquoketa shale and shaly limestone in outcrop. |
| | | | Mohawkian | Galena dolomite - in outcrop<br>Decorah shale)<br>Platteville ls.) in wells<br>Glenwood ss.) |
| | | | Chazyan | St. Peter ss. - in wells |
| | | | Prairie du Chien | Shakopee dolomite)<br>New Richmond ss. ) in wells<br>Oneota dolomite ) |
| | | Cambrian | | In deep wells only. |
| Proterozoic<br>Archeozoic | | Referred to as "Pre-Cambrian" time. | | No data available |

Suggested References for further Study of the Geology of the Field Trip Area.


1. Illinois State Geological Survey Bulletin 26, Geology and Geography of the Galena and Elizabeth Quadrangles, 1916.

2. Illinois State Geological Survey Circular 214, "Geologic Structure Map of the Northwestern Illlinois Zinc-Lead District," 1956.

3. Illinois State Geological Survey Bulletin 21, Lead and Zinc Deposits of Northwestern Illinois, 1914.

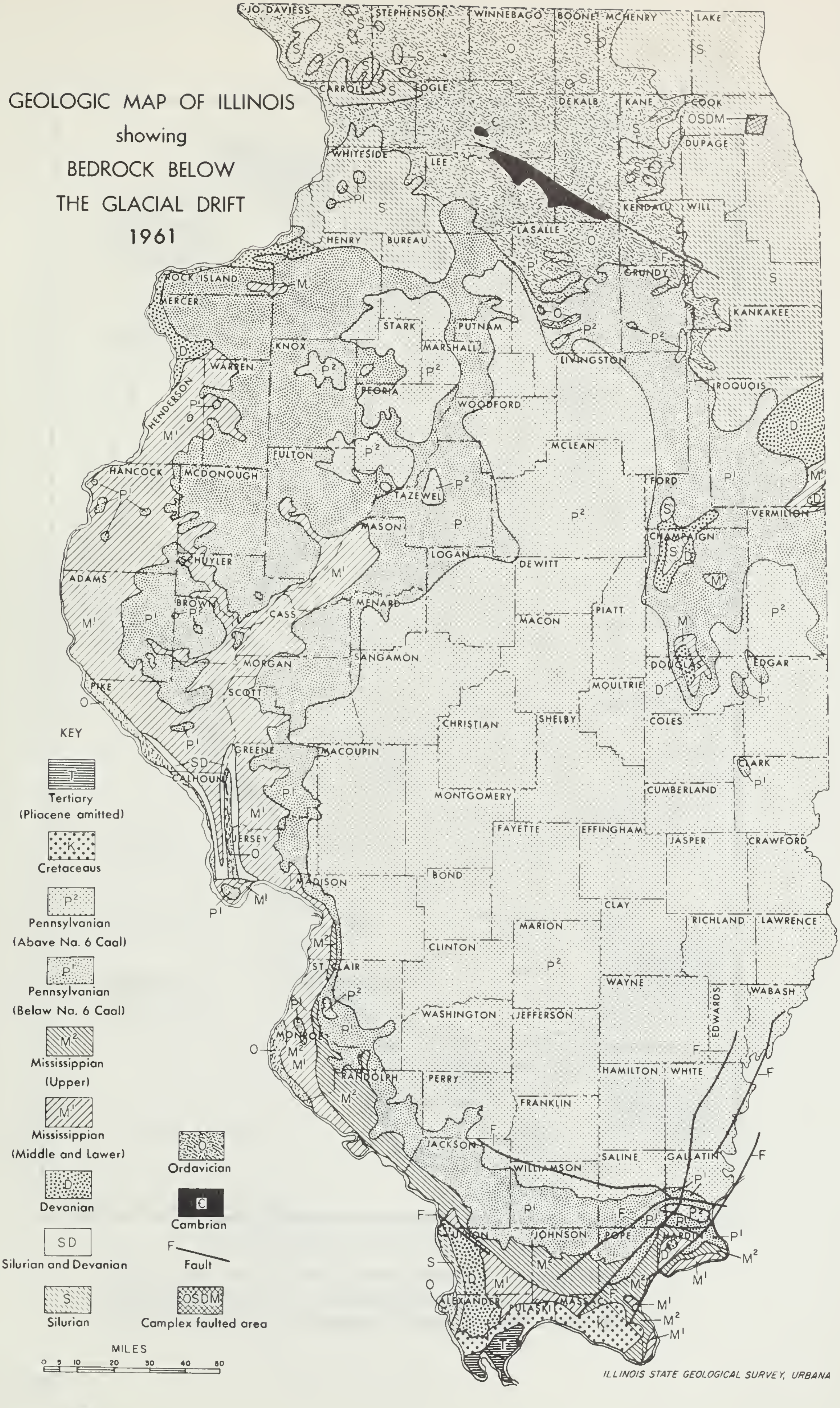
4. Illinois State Geological Survey Report of Investigations 124, Geological Structure of the Zinc-Lead District of Northwestern Illinois, 1947.

5. Illinois State Geological Survey Report of Investigations 116, Geological Aspects of Prospecting and Areas for Prospecting in the Zinc-Lead District of Northwestern Illinois, 1946.

6. Illinois State Geological Survey Report of Investigations 210, Crevice Lead-Zinc Deposits of Northwestern Illinois, 1959.

Time Table of Pleistocene Glaciation
(after M. M. Leighton and H. B. Willman, 1950, J. C. Frye and H. B. Willman, 1960)

| Stage | Substage | Nature of Deposits | Special features |
|---|---|---|---|
| Recent | | Soil, youthful profile of weathering, lake and river deposits, dunes, peat | |
| | 5,000 yrs. | | |
| Wisconsinan | Valderan | Outwash | Glaciation in northern Illinois |
| | 11,000 yrs. | | |
| | Twocreekan | Peat, alluvium | Ice withdrawal, erosion |
| | 12,500 yrs. | | |
| | Woodfordian | Drift, loess, dunes lake deposits | Glaciation, building of many moraines as far south as Shelbyville, extensive valley trains, outwash plains, and lakes |
| | 22,000 yrs. | | |
| | Farmdalian | Soil, silt and peat | Ice withdrawal, weathering, and erosion |
| | 28,000 yrs. | | |
| | Altonian 50,000 to 70,000 yrs. | Drift, loess | Glaciation in northern Illinois, valley trains along major rivers, Winnebago drift |
| Sangamonian (3rd interglacial) | | Soil, mature profile of weathering, alluvium, peat | |
| Illinoian (3rd Glacial) | Buffalohartan | Drift | |
| | Jacksonvillian | Drift | |
| | Paysonian (terminal) | Drift | |
| | Lovelandian (Pro-Illinoian) | Loess (in advance of glaciation) | |
| Yarmouthian (2nd interglacial) | | Soil, mature profile of weathering, alluvium, peat | |
| Kansan (2nd glacial) | | Drift Loess | |
| Aftonian (1st interglacial) | | Soil, mature profile of weathering, alluvium, peat | |
| Nebraskan (1st glacial) | | Drift | |

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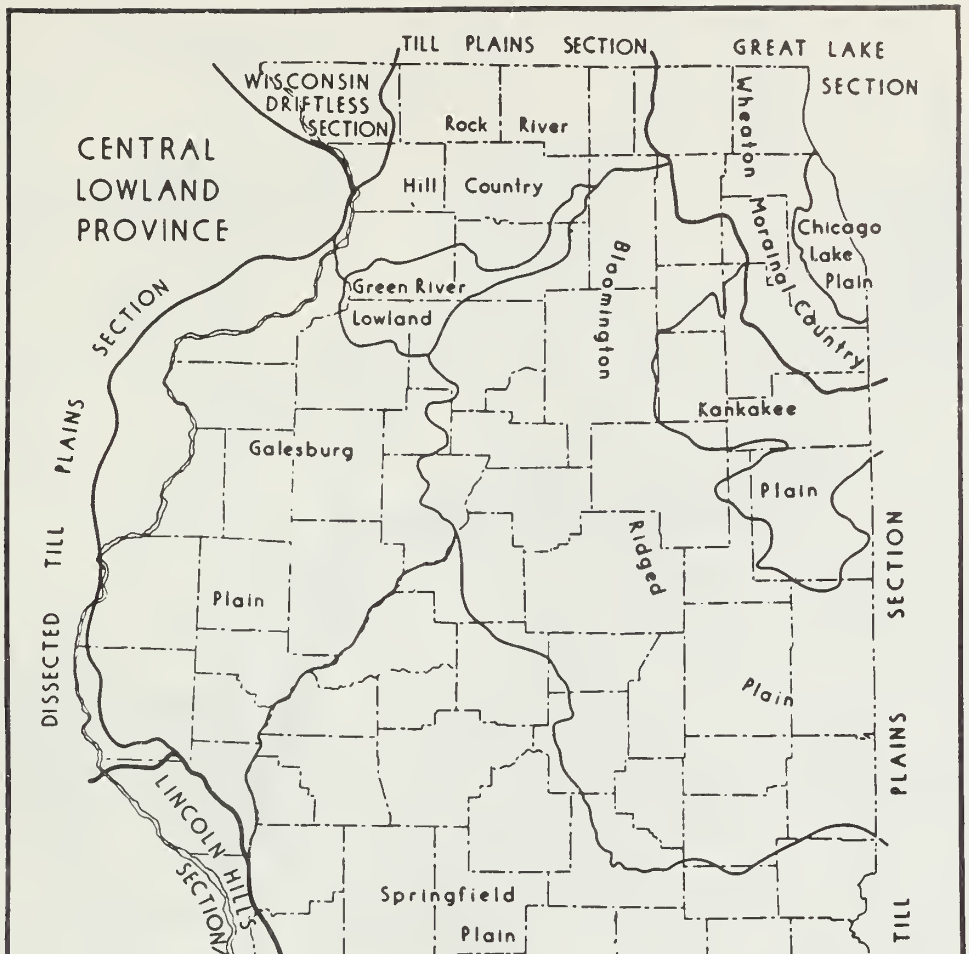


PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

(Reprinted from Illinois State Geological Survey Report of Investigations 129, "Physiographic Divisions of Illinois," by M. M. Leighton, George E. Ekblaw, and Leland Horberg)

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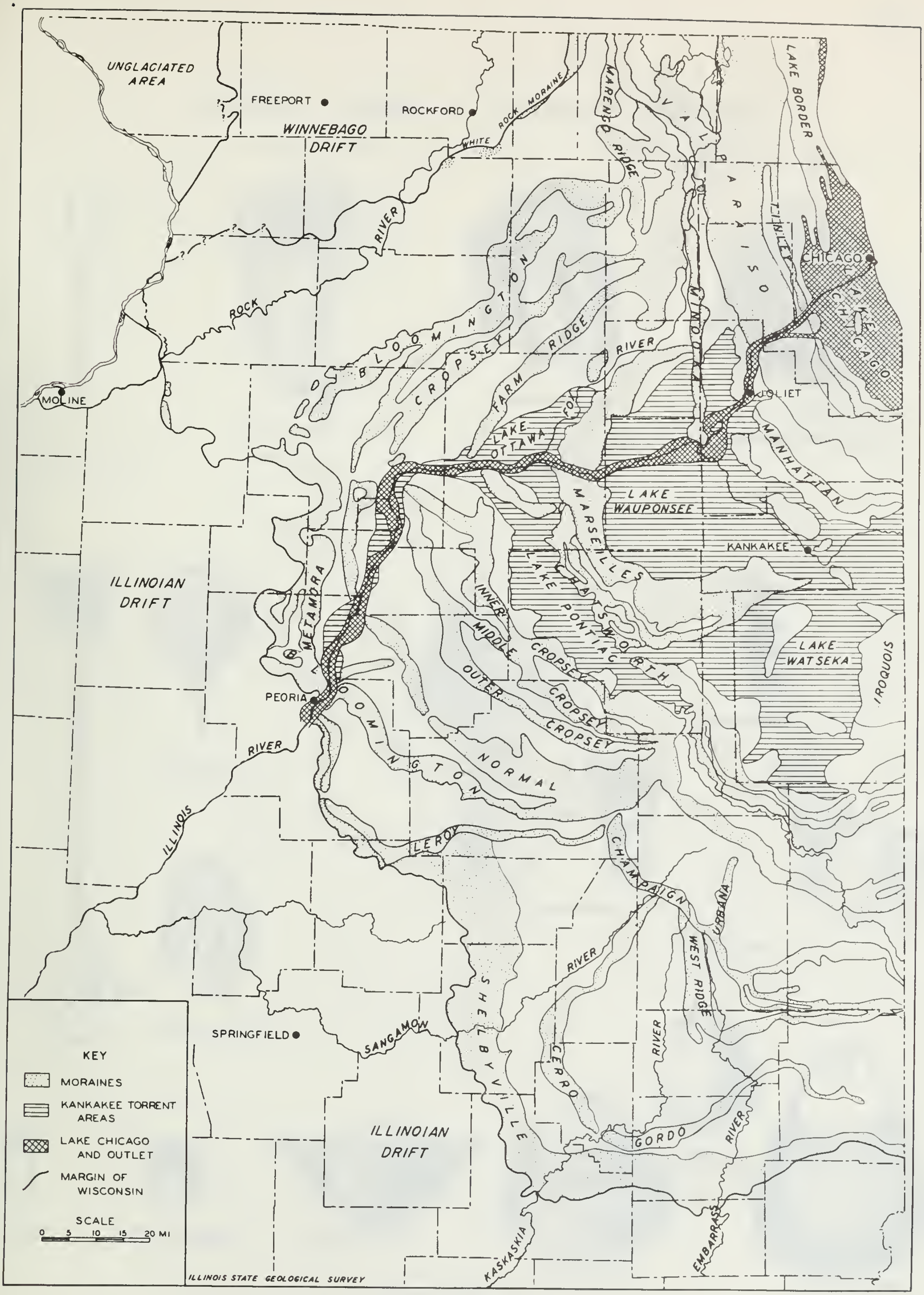


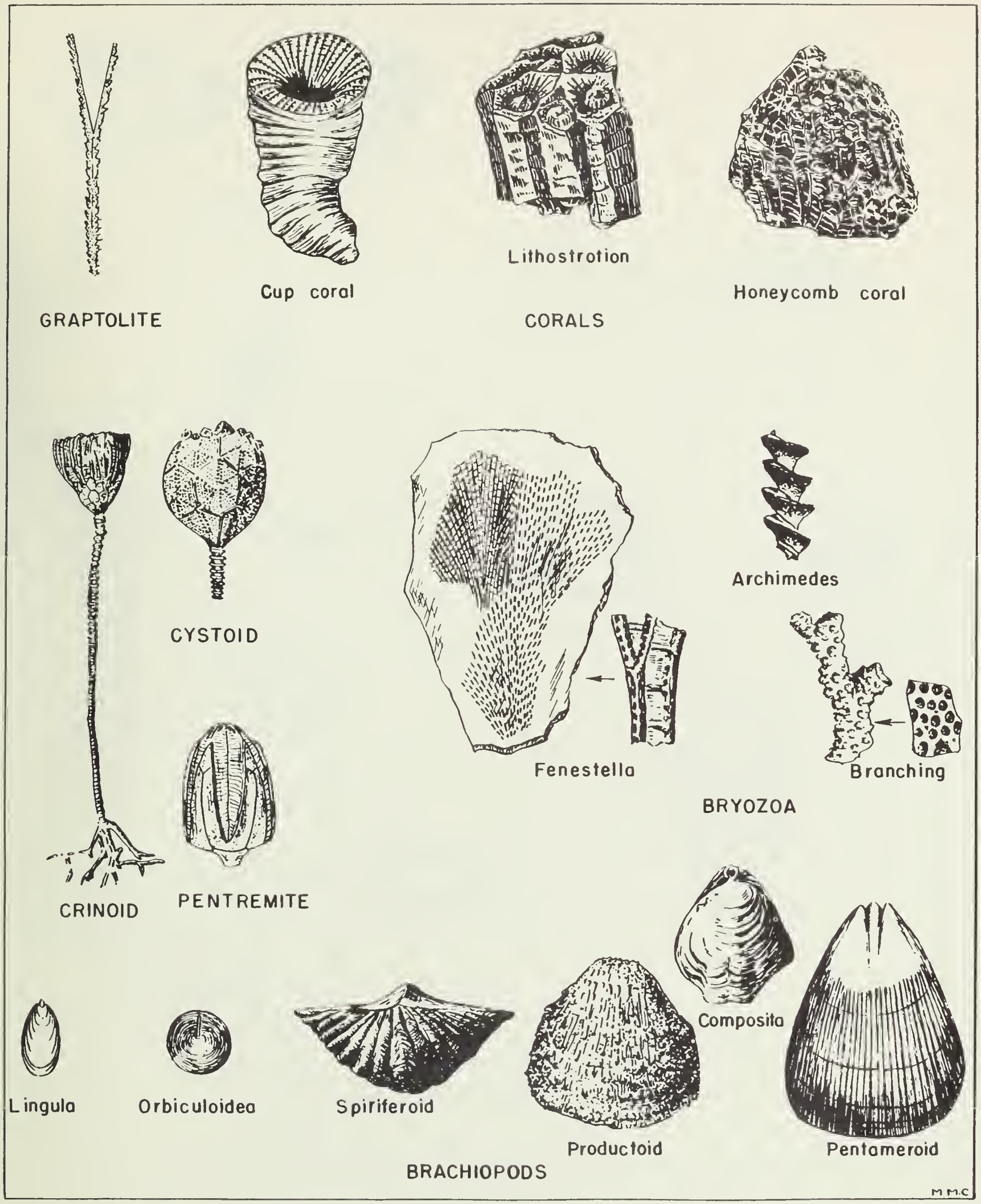

# GLACIAL MAP OF NORTHEASTERN ILLINOIS

GEORGE E. EKBLAW

Revised 1960

(47669—15M—11-61)

# COMMON TYPES of ILLINOIS FOSSILS

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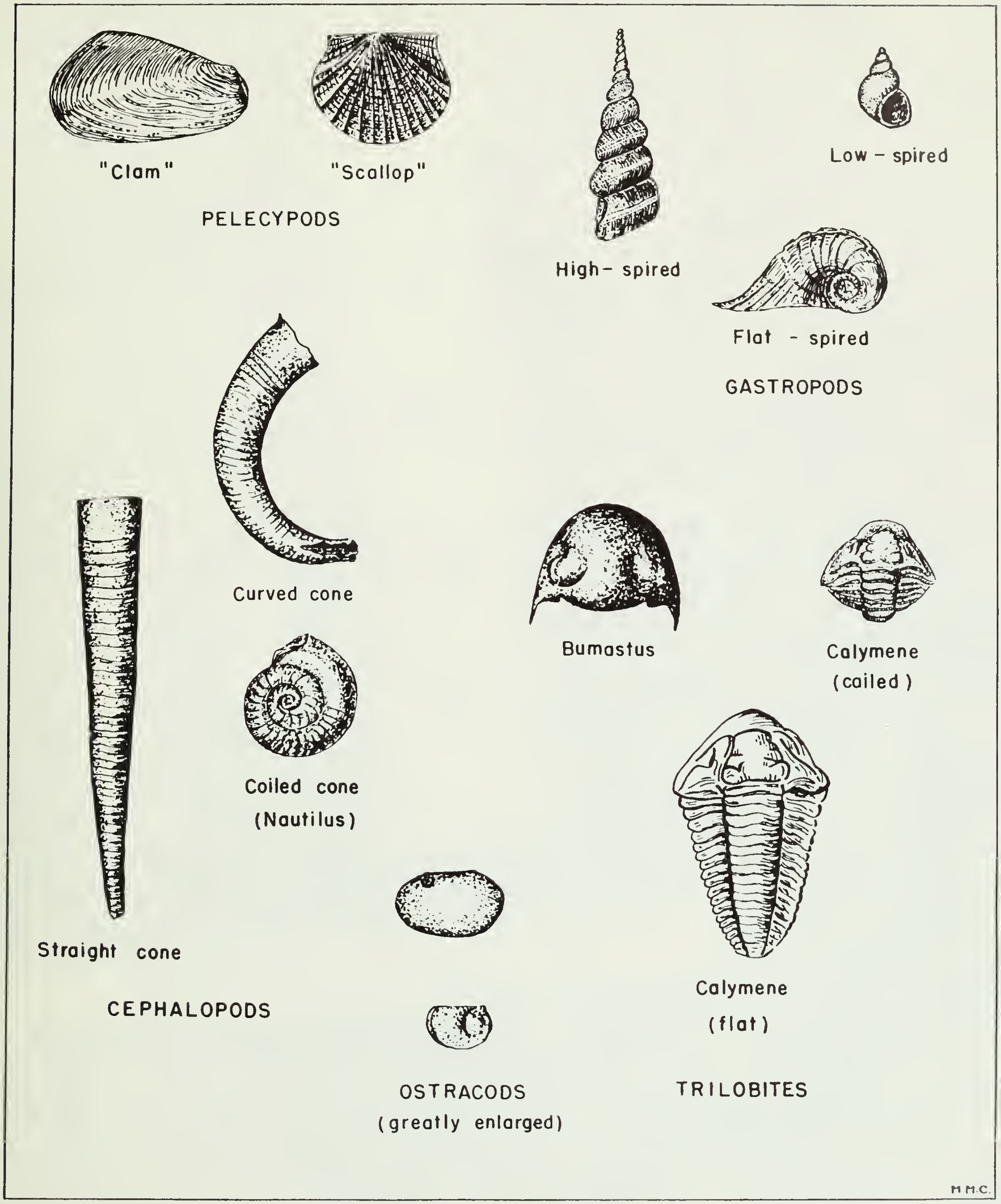
# COMMON TYPES of ILLINOIS FOSSILS




(55757—25M—5-62)